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P/1228-186

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Lars-Gunnar HEDSTRÖM

Serial No.: 10/505,382

Filed: August 20, 2004

Confirmation No.: 5175

Date: April 8, 2007

Group Art Unit: 3681

Examiner: David D. Le

For: ARRANGEMENT AND METHOD FOR ALLOWING DISENGAGEMENT OF A GEAR IN A GEARBOX

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
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APPEAL BRIEF UNDER 37 C.F.R. §41.37

Sir:

This appeal is taken from the final action of September 8, 2006. In support of the Notice of Appeal filed February 8, 2007, the present Appeal Brief is presented.

I. Real Party in Interest

The real party in interest is the assignee, SCANIA CV AB.

II. Related Appeals and Interferences

The Applicant, the assignee and the undersigned attorney are not aware of any related appeals and interferences.

III. Status of Claims

Claims 1-20 are pending and on appeal herein.

IV. Status of Amendments

An Amendment After Final Office Action was filed on December 8, 2006 in response to the final Office Action dated September 8, 2006. In that Amendment, claim 1 was amended to clarify the claim and claim 17 was amended as requested by the Examiner. An Advisory Action issued on January 4, 2007 indicating that the Amendments in the Amendment After Final Action of December 8, 2006 were entered. However, the arguments set forth therein were not considered persuasive. No further Amendments have been submitted.

V. Summary of Claimed Subject Matter

The present invention relates to an arrangement and method for allowing disengagement of a gear of a gear box in a vehicle. FIG. 1 schematically depicts selected parts of a motor vehicle including an engine 1 the drive motions of which are transmitted via a driveline to the vehicle's powered wheels 2. The driveline incorporates an output shaft 3 from the engine 1, a flywheel 4, a clutch 5, an input shaft 6 to a stepped gearbox 7, an output shaft 8 from the gearbox 7, a universal shaft 9, a final gear 10 and driveshafts 11 which are connected to the vehicle's powered wheels 2. The driveline includes a first portion, including elements 3-4, situated before the clutch 5 and a second portion, including elements 6-11, situated after the clutch 5.

The clutch 5 is in principle intended to be operated only at the setting in motion and bringing to a halt of the vehicle, thus not when the vehicle changes gears while in motion.

The vehicle's gearchange system incorporates an electrical control unit 12 designed to receive information from a driver, via a gear lever 13, when a gear change of the vehicle is desired. The control unit 12 is intended, at the time of disengaging a gear, to activate a fuel injection unit 14 in order to control the torque of the engine 1 so that zero torque is obtained in the gearbox 7. When zero torque prevails in the gearbox 7, the control unit 12 is designed to activate a gearchange mechanism 15 which disengages the currently engaged gear.

An arrangement for allowing disengagement of a gear in the gearbox 7 without operating the clutch 5 incorporates a first sensor 16 designed to detect the rotational position P_1 of the flywheel 4, and a second sensor 17 designed to detect the rotational position P_2 of the gearbox

output shaft 8. The arrangement also incorporates the control unit 12 which is designed to substantially continuously receive measured values pertaining to the rotational position P_1 of the flywheel 4 and the rotational position P_2 of the gearbox output shaft 8. The control unit 12 calculates with corresponding accuracy the rotational positions P_1, P_2 of the flywheel 4 and the gearbox output shaft 8 respectively.

FIG. 2 depicts a clutch disc 5a with hub 5b designed to be fastened to the gearbox input shaft 6. A multiplicity of springs 5c, allow resilient elastic rotation of the hub 5b relative to a peripheral portion 5d of the clutch disc 5a. The peripheral portion 5d incorporates friction plates designed to be pressed against the flywheel 4 when the clutch 5 is in a connected state. The relative rotation between the hub 5b and the peripheral portion 5d depends on the magnitude of the driving torque transmitted T. A rotational angle D of at least ± 8° is possible for many conventional clutch discs 5a. FIG. 3 shows basically how the rotation angle D may vary with the magnitude of the drive torque transmitted T. The springs 5c of the clutch disc 5a here provide a spring characteristic which allows a substantially linear relationship between the rotation angle D and the drive torque transmitted T when the rotation angle D is within ± 4°. Within that angle range, the springs 5c give rise to a spring constant which provides relatively gentle resilience. Within the rotation angle range of ± 4° there is therefore a relatively large angular deflection D even when the driving torque T is low. When the rotation angle D is greater than 4°, however, the springs 5c give rise to a spring constant which provides a significantly harder resilience. Even if the rotation angle D is not always allowed to be controlled so as to become exactly nil, the drive torque transmitted T will be so low as to always allow an engaged gear to be disengaged without comfort disturbance. Thus, the rotation angle D and the drive torque transmitted T are related.

When a new gear is engaged in the gearbox 7, zero torque thus prevails in the gearbox 7. To this end, the control unit 12 is designed to store the parameter values P_1 and P_2 received pertaining to the rotational positions of the flywheel 4 and the gearbox output shaft 8 respectively in the form of reference values $P_{1,REF}$, and $P_{2,REF}$. Thereafter the mutual angle A_{REF} between the flywheel 4 and the gearbox output shaft 8 can be calculated and stored when zero torque prevails in the gearbox 7. During the vehicle's operation thereafter, with gear engaged, the control unit 12 receives substantially continuously the parameter values P_1 and P_2 pertaining to the prevailing rotational positions of the flywheel 4 and the gearbox output shaft 8. The control unit 12 uses

information about the parameter values P_1 and P_2 to calculate the prevailing angle A between the flywheel 4 and the gearbox output shaft 8 as the difference between P_1 and P_2. The control unit thereby takes into account the difference in rotation speed between the flywheel 4 and the gearbox output shaft 8 resulting from the gear engaged in the gearbox 7. The control unit 12 calculates thereafter the rotation angle D as the difference between A and A_{REF}. The fact that a clutch disc hub 5b usually has a well-defined rigidity as a function of the rotation angle D (see FIG. 3) here again results in the possibility of determining the value of the driving torque transmitted T. The clutch disc 5a thus here again acts as a torque sensor.

When a driver initiates engagement of a new gear, via the gear lever 13, the prevailing rotation angle D is calculated in the manner described above. The control unit 12 uses knowledge of the prevailing rotation angle D to initiate appropriate control of the fuel supply to the fuel injection unit 14. The fuel quantity supplied is regulated so that the rotation angle D tends rapidly towards 0, i.e. the prevailing mutual angle A is altered towards the stored mutual angle A_{REF} when 0 torque prevails in the gearbox 7. When D is assessed to be 0, substantially zero torque prevails in the gearbox 7 and the control unit 12 activates the gearchange mechanism 15, which disengages the currently engaged gear. Thereafter the control unit 12 regulates the fuel injection quantity by means of the fuel injection unit 14 so that the speed of the engine 1 becomes such that the gearchange mechanism 15 can engage the new gear.

More specifically, the text of claim 1, which is included in the focus of this appeal, reads as follows:

"An arrangement for allowing disengagement of a gear of a gearbox in a vehicle, wherein the vehicle includes an engine at least one powered wheel, a gearbox, and a driveline including a first driveline portion which extends from the engine, a second driveline portion which extends to the at least one powered wheel of the vehicle, and a specific element of the driveline between the first and the second portions,

the specific element being adapted to allow elastic rotation between the first and the second driveline portions when driving torque is being transmitted in the driveline; said arrangement comprising:

a first sensor operable to detect a position (P_1) of the first portion of the driveline, and a second sensor operable to detect a position (P_2) of the second portion of the driveline;

a control unit operable to store at least one measured value which is related to a reference angle (A_{REF}) between the position ($P_{1, REF}$) of the first portion and the position ($P_{2, REF}$) of the second portion when a gear is engaged in the gearbox, and is operable to initiate a control action so that said reference angle (A_{REF}) and a prevailing angle (A) between the first portion and the second portion are substantially equalized before the gear is disengaged."

The remaining independent claim 11 relates to a method substantially used by the arrangement of claim 1, that is similarly the focus of the appeal.

VI. Grounds of Rejection to be Reviewed

The following grounds of the rejection are presented for review:

1. Whether claims 1, 2 and 5-20 were correctly rejected under 35 U.S.C. §102(b) as being anticipated by Huber (U.S. Patent No. 6,151,978).

2. Whether claims 3-4 were correctly rejected under 35 U.S.C. §103(a) as being unpatentable over Huber (U.S. Patent No. 6,151,978) in view of Tojima (U.S. Patent No. 4,601,676).

VII. Argument

Claims 1, 2 and 5-20 were rejected as being anticipated by Huber '978, which incorporates Huber et al. '996. Claims 3-4 were rejected over Huber '978 in view of Tojima et al.

Applicant respectfully disagrees with the Examiner's interpretation of the prior art Huber '978 and Huber '996 (U.S. Patent No. 6,167,996) references, since several features in claims 1 and 11 are clearly new in relation to the disclosures in these two documents.

As was noted in Applicant's previous response of December 8, 2006, the Examiner did not mention the "specific element" in claims 1 and 11, namely "the specific element being adapted to allow elastic rotation between the first and the second driveline portions when driving torque is being transmitted in the driveline; said...." In response to this argument, in the Advisory Action, the Examiner argues that the "clutch element 18 of Huber '978 and Huber '996 is capable of allowing elastic rotation between the first and second driveline portions." However, a careful review of the Huber references shows that no such element is disclosed by either of the Huber references. Indeed, neither of these references includes much detail at all regarding the

Huber clutch 18, much less that it is "adapted to allow elastic rotation between the first and the second driveline portions when driving torque is being transmitted in the driveline," as is required by claim 1 of the present application. As is well known, "[A] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." See M.P.E.P. §2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). In this case, the Examiner has failed to identify any language in either of the Huber references that discloses the recited "specific element being adapted to allow elastic rotation between the first and the second driveline portions when driving torque is being transmitted in the driveline." Thus, claims 1 and 11 cannot be rejected as anticipated by the Huber references.

The Examiner merely asserts that "clutch element 18 of Huber '978 and Huber '996 is capable of allowing elastic rotation between the first and second driveline portions," however, as noted above, neither of the Huber reference discloses such a clutch element. Therefore, Applicant presumes that the Examiner intends to argue that clutch element 18 of Huber somehow inherently discloses the features of the "specific element" recited in claim 1. However, "[T]o serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." See M.P.E.P. §2131.01 III quoting *Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991). The Examiner has also failed to provide any such evidence in the present application, and thus, any reliance on inherency is improper.

Second, the Huber references (in any combination) do not disclose or suggest "a control unit operable to store at least one measured value which is related to a reference angle (A_{REF}) between the position ($P_{1,\ REF}$) of the first portion and the position ($P_{2,\ REF}$) of the second portion when a gear is engaged in the gearbox, and is operable to initiate a control action so that said reference angle (A_{REF}) and a prevailing angle (A) between the first portion and the second portion are substantially equalized before the gear is disengaged." Advantages of this feature are thoroughly explained in the application as well as in the Applicant's previous Amendments. For example, pages 8-9 of Applicant's previous response dated June 26, 2006 discuss some of the advantages provided by the present invention.

In the Advisory Action, the Examiner argued that Huber '996 discloses this feature at Column 3, line 27 to Column 4, line 2. Applicant must respectfully disagree.

In Huber '996, the engine control unit 34 constantly monitors the rotation speed of the engine output shaft 16. The transmission control unit 32 preferably monitors the rotation speed of the transmission input shaft 20. Since these two numbers are known, they are compared to determine the clutch status. That is, based on a difference between the rotational speeds of the engine output shaft 16 and the transmission input shaft 20, a determination is made as to whether the clutch is open. However, there is no disclosure in Huber of a reference angle or of even monitoring the position of elements in the motor. Further, there is no disclosure in Huber of equalizing a prevailing angle with a reference angle.

Furthermore, the documents also fail to disclose or suggest "a first sensor operable to detect a position (P_1) of the first portion of the driveline and a second sensor operable to detect a position (P_2) of the second portion of the driveline." In the Huber references, a sensor 40 is provided for sensing the rotational speed of the engine output shaft 16 and a sensor 42 for is provided for sensing the rotational speed of the transmission input shaft 20. There is, however, no arrangement for sensing the positions of these two shafts. To sense the rotational speed of a shaft in typical automotive applications, the shaft merely requires, for example, regularly distributed teeth or indicia on the periphery of the shaft. To sense the actual position of the shaft, in contrast, requires, again as only one example, teeth that are, at least at one place, unevenly distributed on the shaft. The arrangements disclosed in the two documents only measure speeds of the shafts, not their positions (especially not their positions relative to each other). Thus, not only is position detection not disclosed, but there is no incentive or suggestion for a person skilled in the art to modify the shafts or the sensors and/or to provide a computer program to also enable the sensors to sense the position of the shafts. Therefore, the Huber references neither disclose nor even suggest an arrangement wherein the positions of the shafts are sensed by the sensors 40 and 42.

In response to this argument, the Examiner argues that page 7, line 14-25 of the present specification discloses that conventional devices for measuring engine speed can determine the rotational position of the flywheel 4. However, the Huber references cited by the Examiner do not disclose any such devices. Indeed, as is noted above, the arrangements disclosed in the two Huber references only measure speeds of the shafts, not their positions. Measuring the positions

of the shafts would be more complex and neither of the Huber references discloses the additional equipment or steps necessary to measure the position of the shafts. Thus, neither of the Huber references disclose, "a first sensor operable to detect a position (P_1) of the first portion of the driveline and a second sensor operable to detect a position (P_2) of the second portion of the driveline," as is required by claim 1 of the present application. As is noted above, in order to anticipate a claim the prior art must recite every feature of the claim. The Examiner has failed to identify any such reference or references in the present application.

Nothing in Tojima et al. supplements Huber '978 or Huber '996 so as to support a rejection of claims 1 and 11 and their dependent claims, including claims 3-4.

For at least the foregoing reasons, allowance of claims 1-20 is requested.

VIII. Conclusion

Check No. 26748 in the amount of $500.00 to cover the 37 C.F.R. §41.20(b)(2) fee for filing an Appeal Brief is enclosed. Any additional fees or charges required at this time in connection with this application may be charged to Patent and Trademark Office Deposit Account No. 15-0700.

If this communication is filed after a shortened statutory time period has elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. §1.17 should be charged to our Deposit Account No. 15-0700.

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on April 8, 2007:

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Signature

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Respectfully submitted,

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APPENDIX

The claims on appeal are:

Claim 1

An arrangement for allowing disengagement of a gear of a gearbox in a vehicle, wherein the vehicle includes an engine at least one powered wheel, a gearbox, and a driveline including a first driveline portion which extends from the engine, a second driveline portion which extends to the at least one powered wheel of the vehicle, and a specific element of the driveline between the first and the second portions,

the specific element being adapted to allow elastic rotation between the first and the second driveline portions when driving torque is being transmitted in the driveline; said arrangement comprising:

a first sensor operable to detect a position (P_1) of the first portion of the driveline, and a second sensor operable to detect a position (P_2) of the second portion of the driveline;

a control unit operable to store at least one measured value which is related to a reference angle (A_{REF}) between the position ($P_{1,\ REF}$) of the first portion and the position ($P_{2,\ REF}$) of the second portion when a gear is engaged in the gearbox, and is operable to initiate a control action so that said reference angle (A_{REF}) and a prevailing angle (A) between the first portion and the second portion are substantially equalized before the gear is disengaged.

Claim 2

An arrangement according to claim 1, further comprising a clutch in the driveline, and the specific element is incorporated in the clutch.

Claim 3

An arrangement according to claim 2, wherein the specific element comprises a clutch disc of the clutch, the clutch disc includes a hub connected to one of the first and second portions of the driveline and a peripheral portion of the disc around the hub, the clutch disc being operable to allow elastic rotation between the hub and the peripheral portion of the clutch disc.

Claim 4 (Previously Presented)

An arrangement according to claim 1, wherein the specific element allows elastic rotation of at least ± 8°.

Claim 5

An arrangement according to claim 1, further comprising a flywheel on the first portion of the driveline and rotatable therewith; the first sensor is operable to detect a first parameter which is related to a rotational position of the flywheel.

Claim 6

An arrangement according to claim 1, wherein the first sensor is operable to detect a speed of the engine.

Claim 7

An arrangement according claim 1, further comprising an output shaft from the gearbox, the output shaft being in the second portion of the driveline, and the second sensor is operable to detect a second parameter which is related to a rotational position of the output shaft of the gearbox.

Claim 8

An arrangement according to claim 1, wherein the second sensor is operable to detect a speed of the vehicle.

Claim 9

An arrangement according to claim 1, wherein the control unit is operable to initiate control of an output torque of the engine for substantially equalizing the prevailing angle (A) and the reference angle (A_{REF}) between the first and the second driveline portions before said gear is disengaged at the gearbox.

Claim 10

An arrangement according to claim 1, further comprising a gearchange mechanism in the gearbox; the control unit is operable to activate the gearchange mechanism for disengaging the gear when the prevailing angle (A) and the reference angle (A_{REF}) between the first and the second portions have been substantially equalized.

Claim 11

A method for allowing disengagement of a gear in a gearbox of a vehicle, wherein the vehicle includes an engine, the gearbox, a driveline having a first portion which extends from the engine to a specific element of the driveline, and a second portion which extends from the element to at least one powered wheel of the vehicle, and the specific element is adapted to allow elastic rotation between the first and the second portions of the driveline when driving torque is being transmitted in the driveline, the method comprising:

detecting a position (P_1) of the first portion of the driveline, and detecting a position (P_2) of the second portion of the driveline;

storing at least one measured value which is related to a reference angle (A_{REF}) between the position ($P_{1,\ REF}$) of the first driveline portion and the position ($P_{2,\ REF}$) of the second driveline portion when the gear is engaged in the gearbox, and for initiating a control action so that the reference angle (A_{REF}) and a prevailing angle (A) between the first and the second driveline portions are substantially equalized before the gear is disengaged.

Claim 12

A method according to claim 11, wherein the first portion of the driveline has a flywheel, and the method further comprises detecting a first parameter of the first portion (P_1) which is related to a rotational position of the flywheel.

Claim 13

A method according to claim 11 wherein the gearbox has an output shaft in the second portion of the driveline, and the method further comprises detecting a second parameter of the position (P_2) which is related to a rotational position of the output shaft of the gearbox.

Claim 14

A method according to claim 11, further comprising controlling an output torque of the engine for substantially equalizing the prevailing angle (A) and the reference angle (A_{REF}) between the first and the second driveline portions before the gear is disengaged.

Claim 15

A method according to claim 11, further comprising activating a gearchange mechanism for disengaging the gear when the prevailing angle (A) and the reference angle (A_{REF}) between the first and the second driveline portions have been substantially equalized.

Claim 16

An arrangement according to claim 1, further comprising a first component of the first portion of the driveline, and the first sensor is operable to detect the first component; and a second component of the second portion of the driveline and the second sensor is operable to detect the second component.

Claim 17

An arrangement according to claim 9, further comprising a gearchange mechanism in the gearbox; the control unit is operable to activate the gearchange mechanism for disengaging the gear when the mutual angle (A_{REF}) between the first and the second portions has been substantially equalized.

Claim 18

A method according to claim 11, wherein the first portion of the driveline has a first component and the second portion of the driveline has a second component; and

detecting the position (P1) of the first portion of the driveline comprises detecting a position of the first component, and detecting the position (P2) of the second portion of the driveline comprises detecting a position of the second component.

Claim 19

A method according to claim 12, wherein the gearbox has an output shaft in the second portion of the driveline, and the method further comprises detecting a second parameter of the second portion (P_2) which is related to a rotational position of the output shaft of the gearbox.

Claim 20

A method according to claim 14, further comprising activating a gearchange mechanism for disengaging the gear when the reference angle (A_{REF}) and the prevailing angle (A) between the first and the second driveline portions have been substantially equalized.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None